Ref. 13"/95

Section from Beltar east
on line of Gt. Northern
RR.

at Beltar greenish
shales + massive beds of
cal-argillite-like rock
dip - northerly about 40°
Bluish thin-bedded limestones
came in on top of the
shales - greenish beds - the
limestones are in heavy beds
2 & 4 feet thick + yellowish
fringe in some layers. No
traces of life within the
exception of a stromatoporoid
like form - The shale
+ dirt of the beds made
hunting the section quite
to be laboriously un-
broken. At the corner of
a fountain of the "Castle
Mt. Stark" of McConnell

The railroad comes in
+ ash along the strike
following the heads of
the Middle Fork of the
Flathead River. About 7 mi
from Belton are reddish
beds of cal-argillite
appear along with the
greenish beds. There may
be 2000 to 3000 feet of
the limestone. After
3½ mi of track - exposures
are lost until
Nyack - Camped at 5 P.M.
after a day of almost
constant rain.

Depth 14"/95

East from Nyack,
Can't see strike - Gray
greenish shaky beds 5 1/4
mi - E, reddish - purple
+ green beds alternate
Buff - grey - banded lime

76½ 680.

Sh. N. 30° mag. 2mk
2mk 5' 5' ° E. 30° N.

2 ~~200~~ ans feet thick —

2 @ Red beds cal. argl-
grass & thin sandy
shaley beds (red)
26-0.

1. Greenish cal- argl-
ous sandy in alter-
nate & red & green
banded beds. 24 ov.

Track following strike of beds
about S = 5. of Myack. On
the N. side of river
at least 2 more feet of beds
shown in the side of A-
Dirt.

Cretaceous

2 mi. West of Paola the road cuts the Cretaceous shales — Sh. E & W. Mag. Dip 20° N.

Along the South ocean in the shales —

Castle Creek.

1½ mi. E. of Paola the real shales — after — à or Sh. N. 80° E. W. Cuts Sh. dip N. 30°

The Cretaceous lies unconformably about 1 mi. E. of Paola

Dip 2° N. 15° E.

Joe Redfield's farm on the East of Essex the Jura Shale — upheaved — Shale — Sh. cuts below — Jura & Beaver

Creek the limestone &
E + W. (mag) for 2 20°
N. The beds rock
are underlaid the moss
Castle Mt. Limestone
McConnell. The general
strike run E2 to N. 60°
E, + dip Degrees to 15°
N. 2 mi W. of Bear
Creek a syncline + fault
occurs that dips in
the general trend of the
beneath the limestone

These beds explode
to + across Bear Creek.

Cryptozoan.

600
~~600~~ 600 X

about feet below the lava bed Cryptozoan occurs abundantly in a thin bed of calcareous sandstone. The specimens average about 8 m/m in diameter, a few reach 12 m/m & small ones occur. They range from 12 m/m to 6 m/m in depth.

Between Jaun &
Esex the Black-
foot Inn rises &
the purple & gray
rocks of Jean &
Helen about 1 1/2 mi
above Esex the
purple, green &
& dark shales
beneath the Light

Bid made Oct 10 '95

Bid made Conyan
Lyre at North R.R. Track

Location.

Grade

1. Bank blue gray
clay and loam 700.

2. Bank shish loam
Sand 250 630
45 ¢

3. Bank coal - loam
loose truth mix
calcium mold (one cut)
2250 @ 45¢ 1600

4. Bank blue loam
(mixed to 2)
500 @ 30¢ 250

5. Gravel Bank
Magazine or Alcove
loam
4750 - (30 - 25) 2000
2250

5200

6.

$\frac{HH_{30}}{1320}$

5280

6. Altitude green & purple organ flame heads (brass) lower-jaw at about 100 feet in area green - 1300/@ 20c 450

6 a/1 green flame-like purple flame 2 to 6 - 10 x 1 20c 350.

6000

No fossils - No well defined base or summit,

Part of McConnells Castle Mountain Sh?

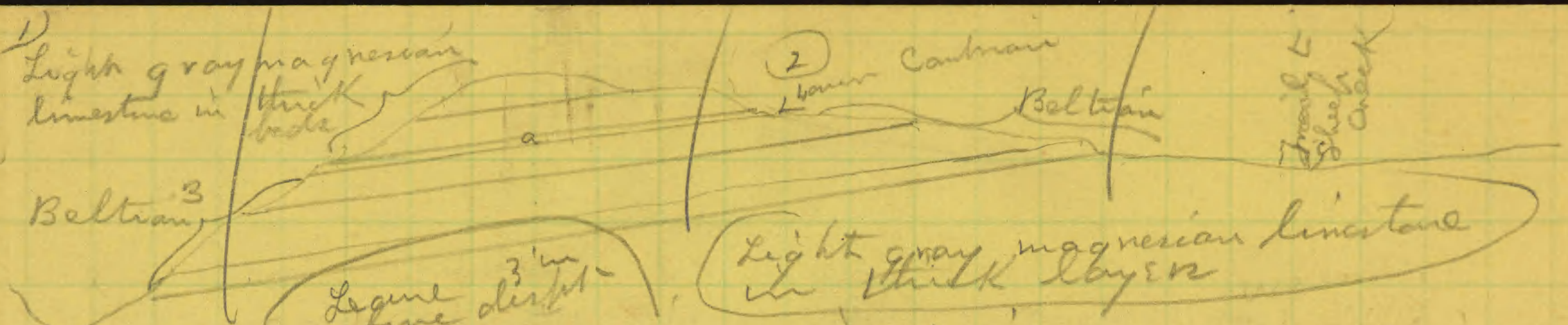


Fig 00

1 West face of Granger Mountain facing Kootenay River bridge + Canal Silats B-. C-. Can!. ~~7-10-25~~ Jasper

a) Elko (Cathedral) formation — (Upper Cambrian) 1800' 548.6

b) Sulphur Mtn. Limestone Metaconodont fauna Lower " 400' 121.9

c Beltian — Impure limestone + arenaceous shales -

Between the Lower Cambrian limestones + the base of the Elko (Cathedral) there is a covered space of about 500 feet (m) in thickness of beds - which may be the Middle Cambrian Burton formation. The limestones dip steeply to the northeast (away

on the northeast & eastern sides of the mountain.

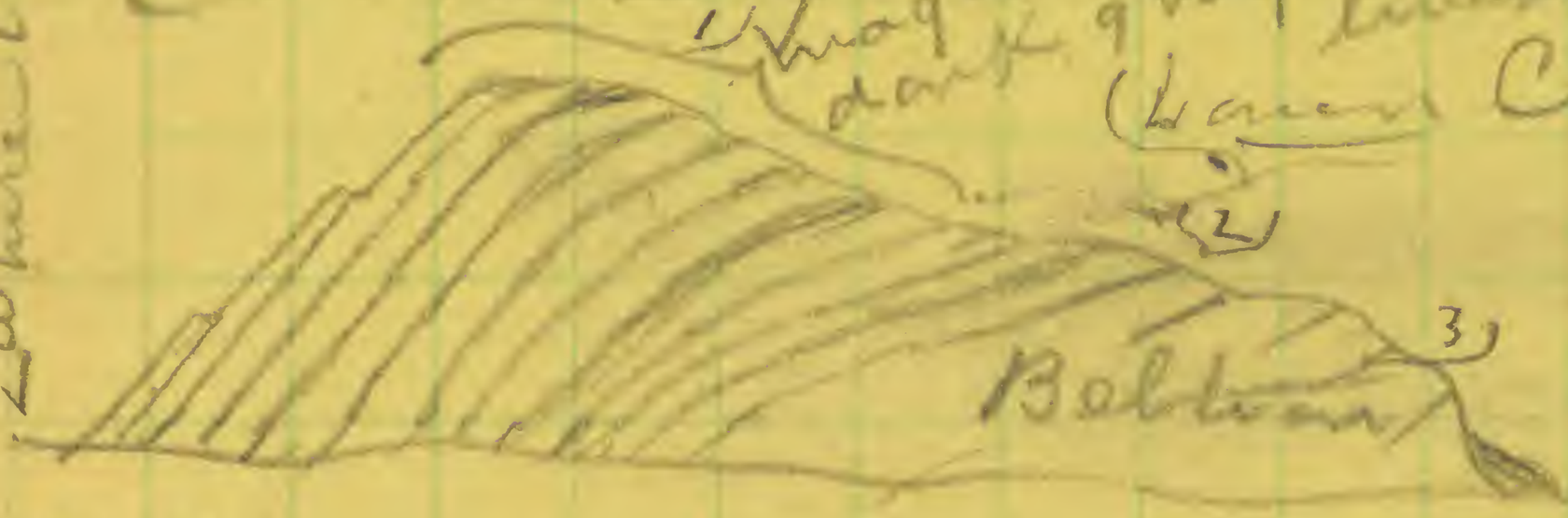
Granger Section.

Section Granger

Formed by Kootenay River about four miles of Kootenay bridge & Canal Flats B.C. Canadian Pacific Line. From the old Granger ranch at the west fork of the mountain on the Kootenay river

altitude about 4200 ft

(Swansea limestone, Wapiana dark grey limestone, Lower Cambrian)



N.E. — S.W.

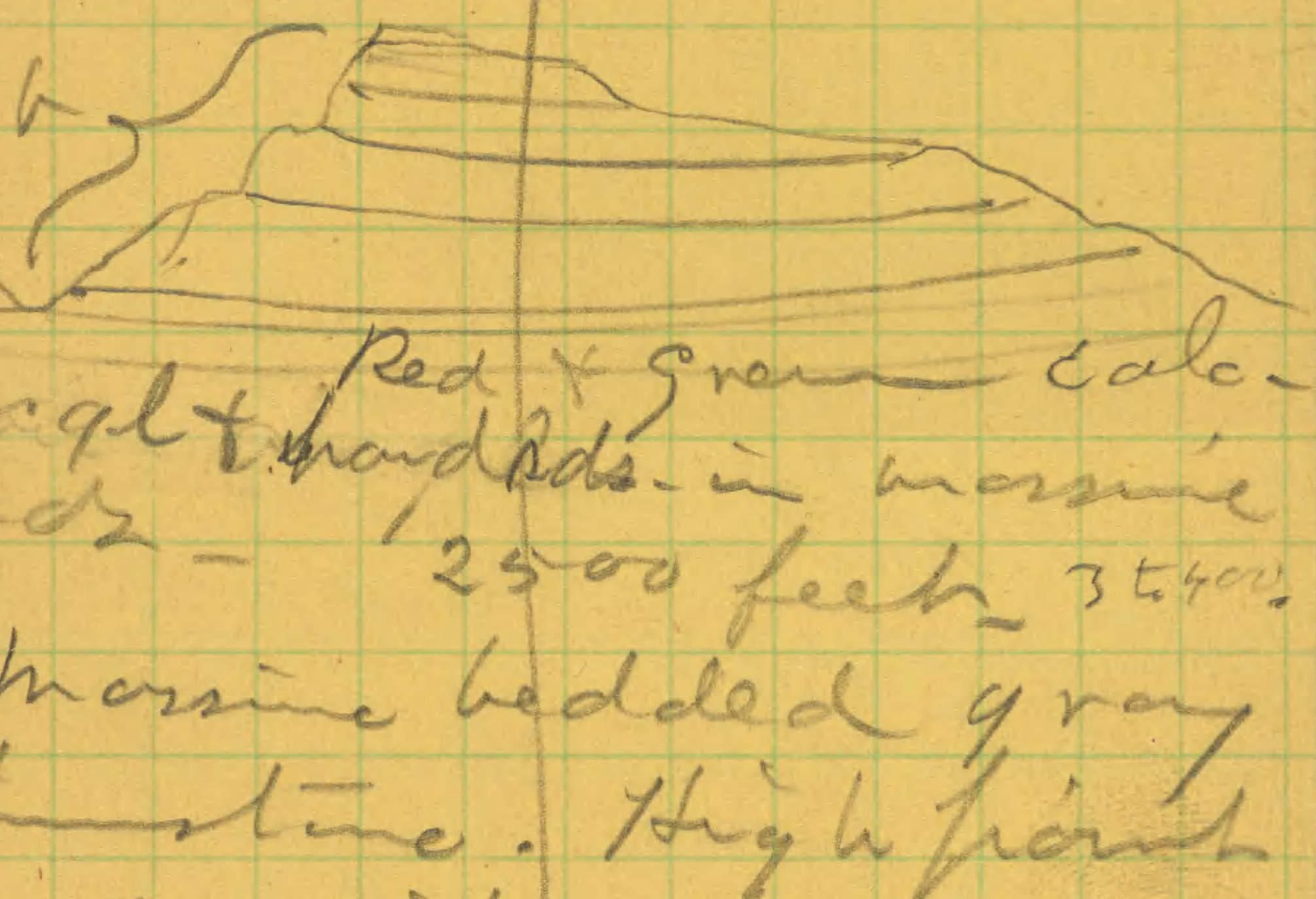
Not S.W. section. See map for North face Section.

7-10-23.

Eleanor Park Begger

Castle Mtn

Mud Creek Canyon
12 mi N.N.E. of Wyack
Mont.



a. Red & Green Calcareous Sandstone in massive beds — 2500 feet — 3 to 400'.

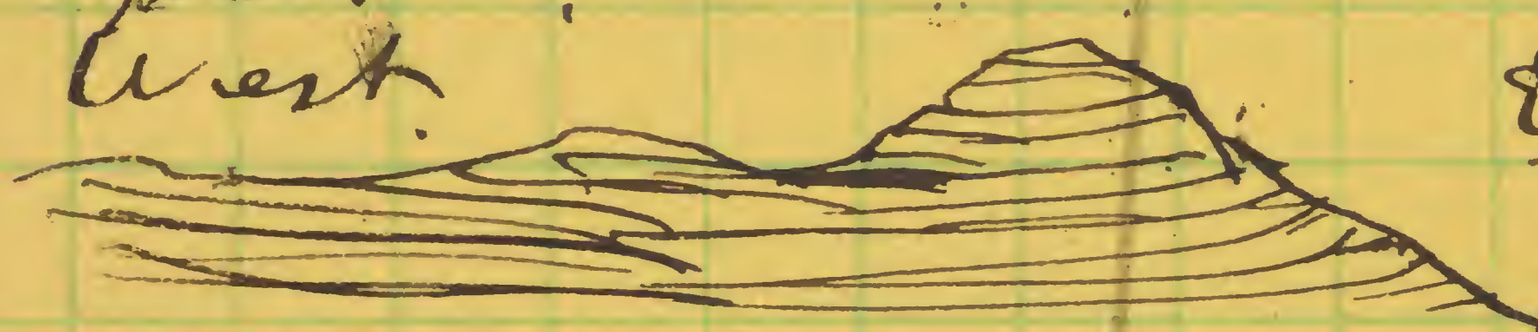
b. Massive bedded Green Limestone. High front on E. side of Canyon,

Deep photographs taken at this point.

Sept. 19/95

at the head of Wyack

Creek a fine amphitheatre
is eroded out of the Red
Beds & superjacent calc-
shales & limestones. The
Cattle Pt rocks form
five ridges & peaks along
the Rocky Mt divide
for many miles, there
is evidently a fault
on the East as the
strata rise & end abruptly
as far as could be seen
West.



East

Ten minutes after divide
was reached a storm
of sleet followed by
snow & rain set back
to the valley below
& to camp.

Sept. 14th/08.

An high summit N.W. of Bear creek section house on Sr. N. Ry.

A wilderness of Algonkian rocks - in all directions. The high ridge west of Enos ~~Patola~~ & Paola is formed of the Blackfoot limestone with superjacent red & greenish beds of the Camp creek series - South the same series for 15 miles or more - East the upper series (Camp creek) with the Purcell lava beds & below the Blackfoot lime - North the Camp creek series -

N.E. a high point of the Blackfoot limestone on the Continental divide. Took photographs but clouds were heavy -

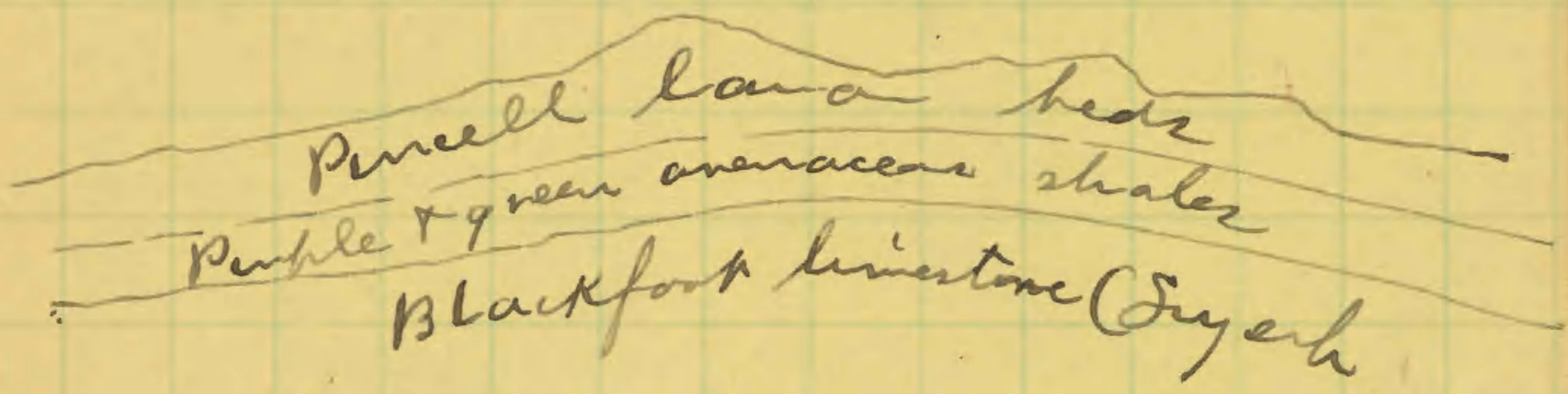
Sept. 13th 08

Algonkian

Gr. Northern (Glacier)

Pass on Continental

Divide.



The Purcell lava bed caps the mountain on the north side of the pass & also the hills on the south side - Below the purple & greenish arenaceous shales & thin bedded rocks - extend to the base of the ridge - On the west slope of the Pass the Blackfoot lime-stone is exposed & extends for 5 miles Southwest forming high hills on both side of the canyon of Bear Creek.

Belton to Nyack
Sept. 10/08.

Algonkian —

About a mile east of Belton the basal beds of the Holland limestone dip ~~east~~ 20° east & N. (mag.) The alternating limestone & siliceous shale & argillite continue on up the canyon of the Middle Fork of Flathead river to the west side of mud flat where they are cut off by the Purcell basalt sheet.

There is a beautiful thrust of the Holland limestone ~~of~~ along the Great Northern railroad.

Fossils Gunnig'ah Pan

Fossils in Sujah -

An ~~south~~ East side of Gunnigah Pan & above head of " lake -

Varied forms of a small Cryptozoan occur abundantly in dark flinty gray lm - above the buff weathering thin bedded lm - Also many small arching sections that appear to be sections of shells - I think they are the concentric laminations of the Cryptozoan - They assume many imitative forms wh might lead to thinking that sections of brachiopods & gasteropods were present.

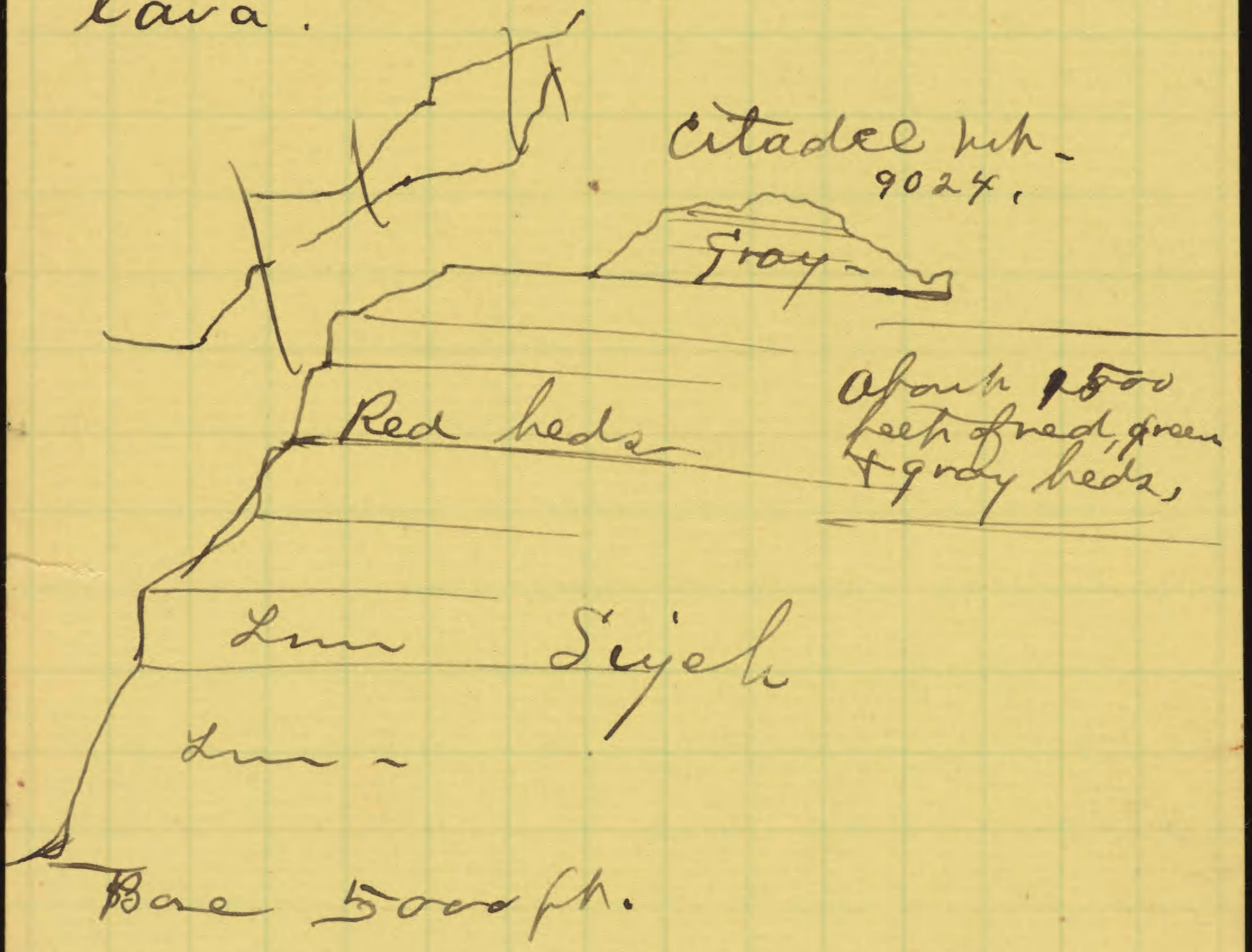
Near Kiplz Cabin we found Cryptozoan abundantly in the arenaceous beds above the Sujah & below the Purcell lava bed -

Thus far there is nothing

to indicate that the Sigeh-
or supergaash-Kuitta is any-
thing more than the Belteau
series of Algonkian.

Obtained some very good
specimens of a small species
of Cryptozoan 1/16 to 2" in
diameter - material for
sections - & silicified spicus

Citadel Sunset Pass
~~Cathedral~~ Mtn S.E. of Sun-
set Lake. Its section shows
Light Gray about 1/2 way up & then
reddish, greenish & gray arenaceous
beds to the top. No Purcell
lava.



Aug 7th/08

Algonkian.

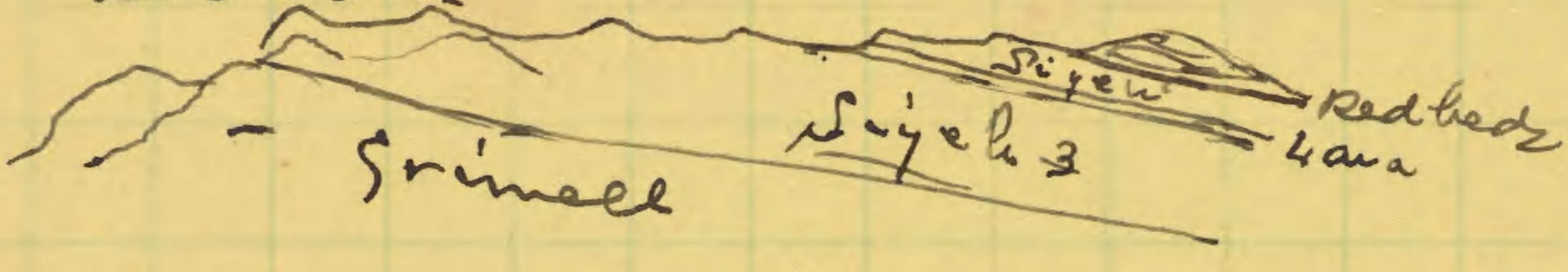
Gunsight Pass.

At Reuter lake (5914 ft) west of the Pass (7000ft) the chocolate brown, reddish, gray + greenish thin bedded compact arenaceous rocks of the Grinnell formation outcrop with an easterly dip of about 20°. These extend to the nearly the summit of Sunrise peak (9250) forming a section of 3000 feet. Above the Grinnell beds the Siyeh limestone shows finely as it slopes eastward to the lower end of Gunsight lake (5276) At the north side of the lake the low ridge extends of the slope of Fusilade (8747) mountain to the an intrusive lava flow. 2500 feet + above the lava 700 feet more, arenaceous, reddish brown + greenish strata similar

Sunset Pass

to the ~~Siyeh~~ Grinnell formation continue to the top of the mountain - 400 feet +

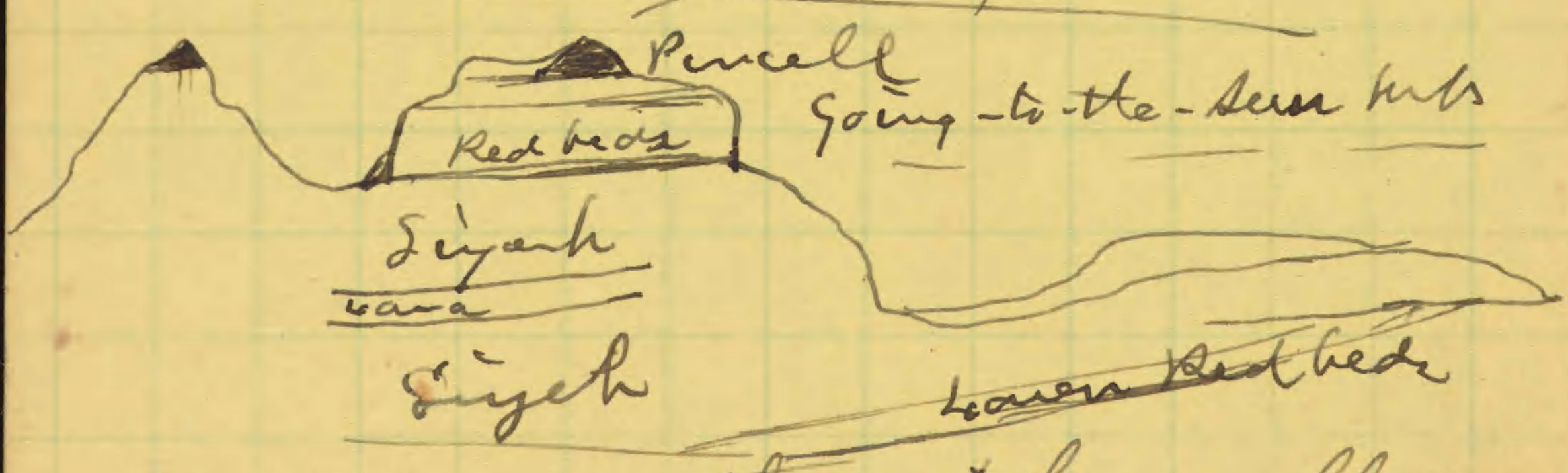
Lectai -



~~Grinnell - 3600 ft.~~

Past Siyeh - 400.
" 800 -
" (Lava) 425 -
2700 -
" 3600 -
Grinnell

Eastward the dip flattens out + the strata rise until a westerly dip in Going-to-the-Sun mountain and Siyeh peak (See photo #)



Siyeh Peak appears to be capped with Purcell lava -

Sept. 22d/08

Algonkian.

Helena limestone.

Examined Helena limestone beneath Cambrian sandstone east of Helena, mont. In lithological characters & stratigraphic position the Helena limestone is the equivalent of the Blackfoot limestone of the A. U. of Helena. Reddish Arenaceous shales and sandstones of pecan above the Helena limestone and between it & the Cambrian sandstone.

The Blackfoot limestone is the same as the Holland limestone & this season I have traced the Holland into the Rich limestone. along the line of the Southern railway between Corum & the Summit.

Algonkian - Sept 21/08

At the great Northern Pass over the Continental devide the Algonkian Blackfoot limestone has been thrust eastward over and on to the Cretaceous on the north side of the Pass. At the Pass erosion has removed the Algonkian strata so that the Pass for a half mile west of the summit is in the Cretaceous. The latter strata extend south of the Pass for several miles forming rounded, wooded hills.

Cretaceous

= South of Pass.

Algonkian

The Pass owes its existence to the breaking down of the hard Algonkian rocks above the soft Cretaceous shales & sandstones -

Aug 6/08.

Taking photo at Sunset Pass.

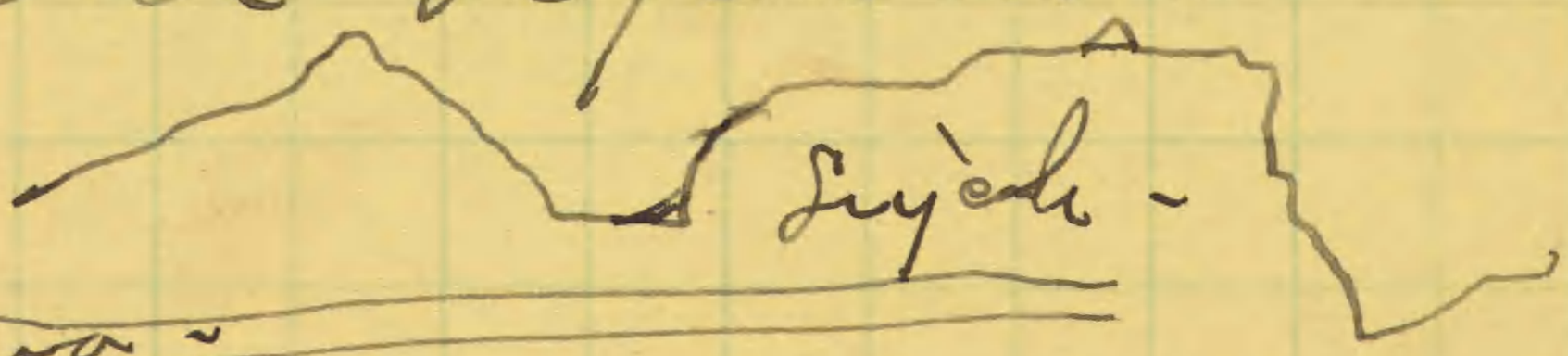
Air hazy with smoke.

6 x 8 films.

1400 feet of Grinnell formation from lake north of Pass to summit of ridge - about 1600 ft. all sandy shales & thin bedded rds & gray qtzite rds - & maroon red & green in bands.

Pinnacle of Grinnell beds on N - side of Pass -

Going-to-the-Sun Mountain mtn. capped with Siyeh lm.



Haun -

Red beds

Over

Banded Teal of Grinnell
as seen in N. Platte above
Gunsights Lake.

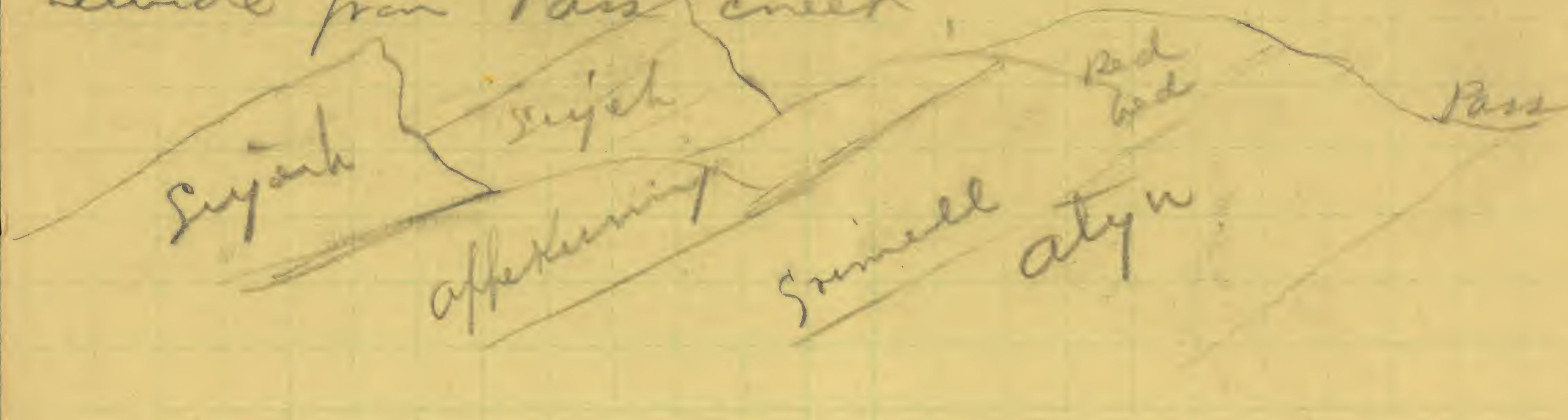
Gunsight Lake -

Reuter Lake

6747.
5276
1471.

9782.
6917
3334.

Oil Creek section above
Leonide from Pass creek.



July 14–16/08

Locality 320 - of C.D.W.

Algonkian -

Beltina danai - one of the alternations. The fragments of the crustacean occur in immense numbers & range through about 100 feet of shaly & thin bedded siliceous limestone. Fragments 4 to 5 inches across are frequently found.

Loc.

about 2 mi E - of divide at head of north branch of south fork of Old Man river west of Pincher Creek - Alberta - Canada +

Algonkian) July 28/08.

Waterton Lake.

At the foot of Waterton lake the Waterton dolomite (Daly) outcrops at Cameron Falls. On the west side of the lake a low anticline exposes about 300 feet of the section. The Altyn limestone anchors on the dolomite & dips to the south. This in turn is overlain by the Appekunny & Grinnell argillaceous formations and at the south end of the lake Helena limestone. At Valentine creek the low flats of grey siliceous strata above the Lower one well exposed & on the (Valentine formation) & on the west

lake of Kootenai peak
the section shows the
Purcell lava bed capping
the Valentine & above
that the Shepard for-
mation & at the summit
the Kintla formation.

Cameron (Oil) creek section.
From Cameron falls the
Altyn limestone dips
slowly to the west & the
section is continuous
thru the Appekunny-
Grinnell & Siyeh forma-
tions. (Healy's section)

The Valentine formation
with the superficial Purcell
lava bed - Shepherd &
Kintla formations form
bold cliffs on the west
side of Little Kootenai
creek for about ten
miles ~~to~~ south of

Waterton Lake. Above
the gray & purple arena-
ceous beds of the Laber-
tine formation the Purcell
Land Red (12,500 to 22,500 feet
thick is a marked feature
for miles. The lava
beds shown down to
Little Kootenai creek.
about ½ mile up from
the northern end of
the creek. It also
forms a broken ledge
along the Continental
divide north of Kintla
Cabin.

In the Kootenai peak
section the buff weathering
hard arenaceous shales
& sandstones of the Sheppard
formation cap Kootenai
peak & extend west south
west beneath the deep
red beds of the Kintla
formation.

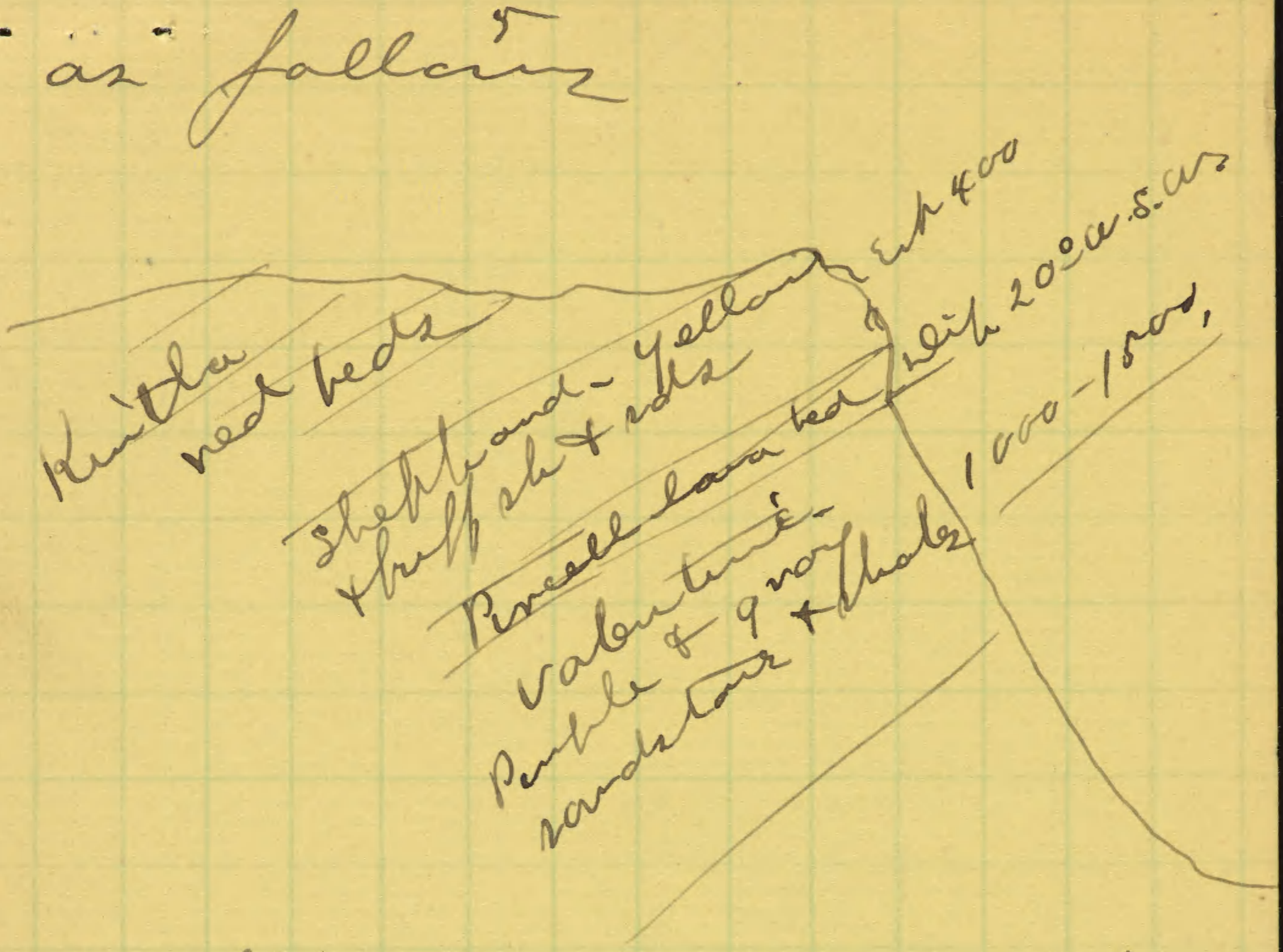
The Kintla forms the higher portion of the western ridges & slopes westward towards Vulture peak & the ridge south of Quartz lake.

Flatiron & West Flatiron mountains are capped by the Kintla red beds & form the bottom of the syncline extending south toward Conuma & Clements mountains.

To the north the strata of Kootenai peak for the Eastern interior side of the syncline & the strata of Vulture peak one on the western limb both being the red beds of the Kintla formation.

The section of Kootenai peak is roughly as

as follows



Are limestone nodules with
fossils below the Purcell
lava bed.

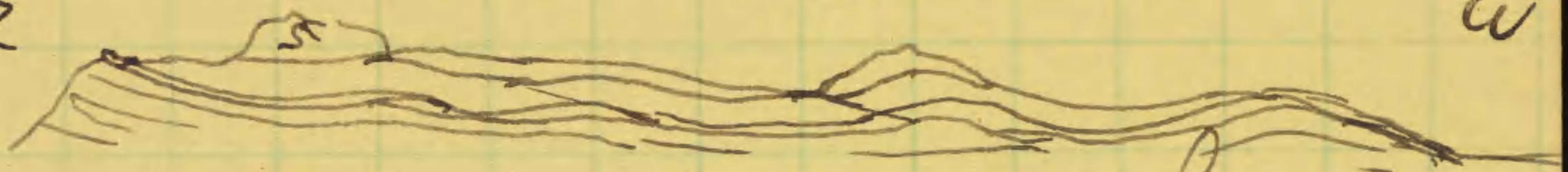
Algonkian area 7-18-08

B.C.

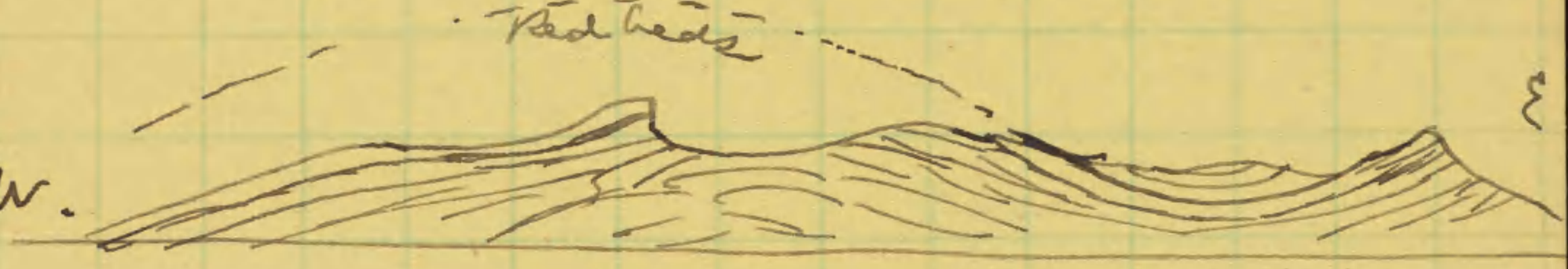
From the high ridge directly
south of the divide at the
head of the North branch of the
South fork
of Old Man river runs
in a Southerly course to Flathead
valley. there is a grand
view of the Rocky Mts
from the interior of the
range: the back slopes
of Castle Mt. Victoria
Peak, on the east: the
north slopes of the Kintla
& Boundary ranges: the
spurs of ridges & points
between, to the south: the
~~mass of~~ broken ridges
& peaks to the north with
the high summits along
Crown Mesh pass & north
to the limit of vision -
On the south the head
heads of the ~~of~~ Spinnéll
formation cañon and

long flat top ridges of limestone. The great Sheep limestone rests on massive cliffs above the red beds.

The general structure from the Flathead valley eastward is about as follows. (See photo of July 19/08)



An occasional thrust fault or a small scale is indicated.



A block of strata 8 to 12 thousand feet thick that is 20 X 40 miles undulates, ~~flows~~ spurs in gentle anticlinal folds ; (monoclinal) small domes & basins with the whole

edges of a thrust mass thrust over the Castle Crag.

The Beyèh lim is confined to the region south of Castle Mt. (as seen from this ridge) It occurs on the south side of the ~~river~~ valley and returns as a faulted down the ~~block through Castle Mt. & the~~ North Kootenay Pass. West of this area is occupied by pre-Beyèh Algonkian formations. (See on back

Fossils

Passed over fine outcrops of Altyn limestone & shale but could not find trace of fossils except in the Belt(?) beds. These are about 100 feet thick & contain thousands of fragments -

July 28th/08.

a large block of Siyeh limestone occurs on the east of [illegible] pass. It is faulted down. The red beds appear from beneath it on the east in the canyon & a [illegible] sill of lava shows as a dark narrow band about 800 feet above the limestone & conformable with its bedding.

July 15th 08

Algonkian.
B. C. & Alberta.

Two miles south of pass over Continental divide a low anticline of Altyn (Newland) limestone access with an east & west axis. About 200 feet from the base Beltian clastic rocks occur in great abundance as fragments. It extends thru about two feet of thin bedded dark gray, & shaly, siliceous & magnesian limestone. Above the limestone & overlies thin bedded strata, continue up 4 to 5 hundred feet.

Estimate for Altyn - 600.

Appekuny - 1600

Grinnell — 2000.

Leigh. 1000+

All the area between the 49th Par. — on the south the Flathead valley on the west. The Cretaceous & Cretaceous along south of the Crowsnest Pass route found the north line of the Cretaceous of the ~~Eastern~~ Eastern foothills of the Rocky Mts is unconformable by Algonkian rocks.

No traces of Cambrian (Castle Mt. — pones) or Carboniferous limestone were noted in this area. Upon the uncolored area on Dr. Geo. M. Dawson map of 1886.

24 July 1929

North Fork Blackfoot River,
Montana.

On a general trip up the river examined the various outcrops, particularly the more massive limestone layers. Practically everywhere these beds, as well as the limy layers, lenses and stringers in the shales, show that they are of algal origin, even though most of the beds are now rather strongly metamorphosed.

Some of the black shales, which appear to be the exact counterpart of much younger black shales, sometimes even of bearing oil shales, have fragments and markings that closely resemble the Burgess shale algae.

27 July
1979.

Between Phillipsburg and
Georgetown Lake,
Montana

The road across this divide runs practically all the way in the Belt series. A thick bed of fine black shale is there exposed.

27 July - 1929

Stalkaho Pass. Montana.
[Sapphire Range]

Crossed the range from the Bitteroot Valley side x All the rocks on the western side are Archaean gneisses. Just below the falls, where the road follows Darby creek to the northeast for a number of miles, several thousand feet, perhaps, of the Belt series are encountered - Then the road again traverses the gneiss

Neihart Road.
Little Belt mts.

12 August 1927
with R. S. Bowles

Flatten'd lenses Rills and tracks
as usual.

Nobby shale capp'd with dking wood
consists of green and purple alpha
with siliceous sandy layers and
lenses of limestone nodules and
bands of chert. With fossils.
Aorthiscus capella. Incl. Orbic. -ca
thid. sp.

Norland Creek,
Montana.

11 August 1927
with R. S. Bassler

N 45° 30° W

Section Lower of the Fattion (part).
Contact is generally obscure. Black
dirt soil, covered by a clean fine
Metaquartz. ——— of
[Facing the outcrop give the
following horizontal thicknesses. The
thickness of each layer as to be
computed from the 30° dip.]

1200 × 30° Quartzite of the usual flatbed type.
Crumbly & dirty. Toward the base
layers of Incrustate. Some of the
650' thick beds contain considerable fine rock.
The topmost layer become sandstone.
Sp. G. Fine exact density are perhaps in
Less fact more than a few of the
measurements. f

——— Igneous rock. (Sample Taken) (Unit 6)

1050' × 32°
75'

600 × 30° Micaceous shale. Contains thin beds of
300' sandstone with shales.
810 × 30° At 810 feet rests a small Cobble-quartz bed
165' of Glacial pleistocene ? age (Unit 2, Unit 1 in part)

465 × 30° At) ft. found beds Conglomerate Tuff
233' With a few beds shifted. (Unit 3.
Near the base of this a few layers
total 708' of limestone conglomerate pebbles
Unit 4.

——— Blue, fole, little homogeneous limestone
600 × 30° fossil fragments absent. Brownish 600
400' near base. Some chert beds.
Much igneous intrusion & dense
fine dark grained Igneous rock. Unit 5
(next sheet)

Newland Creek
Montana

11 August 1927

(Sheet 2)

more than three - fourths of the entire formation. (Samples taken col 6)
The igneous rocks crop on the spurs above the road but the limestone occurs above these outcrops

---

250' × 60° — 125' — Sandy shales, not well exposed. Few fossil fragments probably present. Some of the beds are somewhat calcareous

---

660' × 30° — 330' — Limestones, thin bedded, brittle, blue to gray, well jointed. Some semi-crystalline, some oölitic and edgewise & pebble conglomerate. Obscure fossil fragments.

1275' × 30° — 113' — Limestones. Thin to thick-bedded (15") cliff forming, much pebble and some edgewise. Oölitic and with glauconite. Fossil fragments very numerous. Few identifiable fossils can be secured. Crepicephalus fauna.
Contains a few shaly partings.

Eo[illegible]? — Red beds. Slightly calcareous sandstones in layers up to 10" inches thick interbedded with simple red and bright green shales. Unfossiliferous. It contains some lighter limestone layers.
Thin-bedded gray limestone. Devonian.

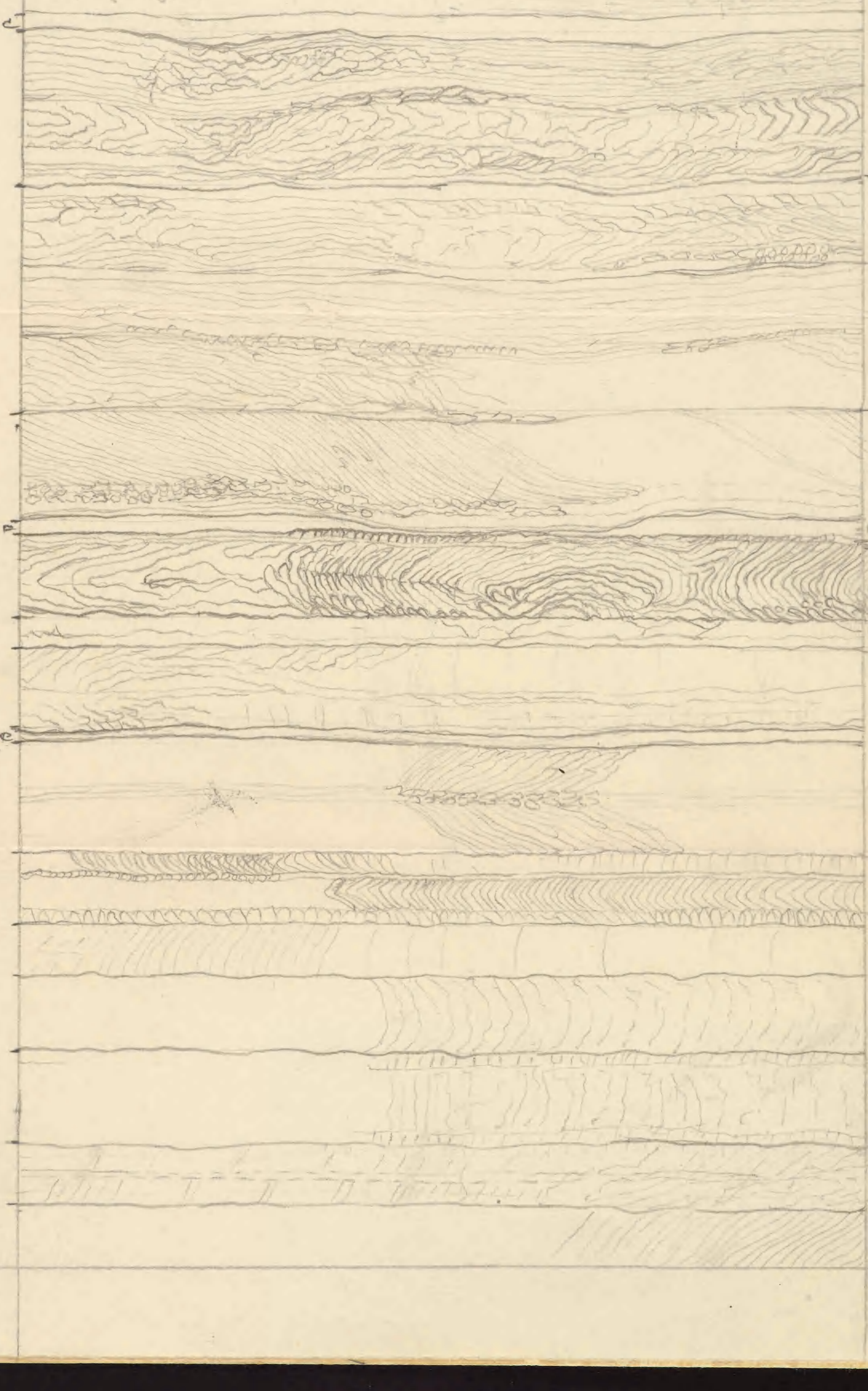
(Locality 400L)

165/

Nearly banded

Nearly massive

14



7-7-19 w.

Cambrian Section.

North side of Beaver Creek. N.W. end Big Belt Mts. Mont.

Siliceous, slaty, dark shales of the Grayson formation, Belt terrane.

Str. N. 42° W. (mag)
dip S. 48° W. 30°

Flathead Sandstone.

1. Gray - massive bedded quartzitic sandstone with a few ~~few~~ conglomerate layers formed of small pebbles +

Str. N. 58° W.
dip S. 32. W.
Shale increases to 40° near top of ~~edge~~ then back to 35° & finally to N. 50° W.

4 —	19
2 —	21
2 —	5
2½	
2½	105.
4.	15
	120.

32
5
160
24.
184

119
5
595

421
5
605
90
695.

Cambrian. (2) Beaver Creek.

At 225 feet thin
bedded yl ss & occas
a gain at 355 a band
of thin bedded a occ ss.
at 640 feet the massive
beds of yl ss - grade very
to shaly ss & shales.
640

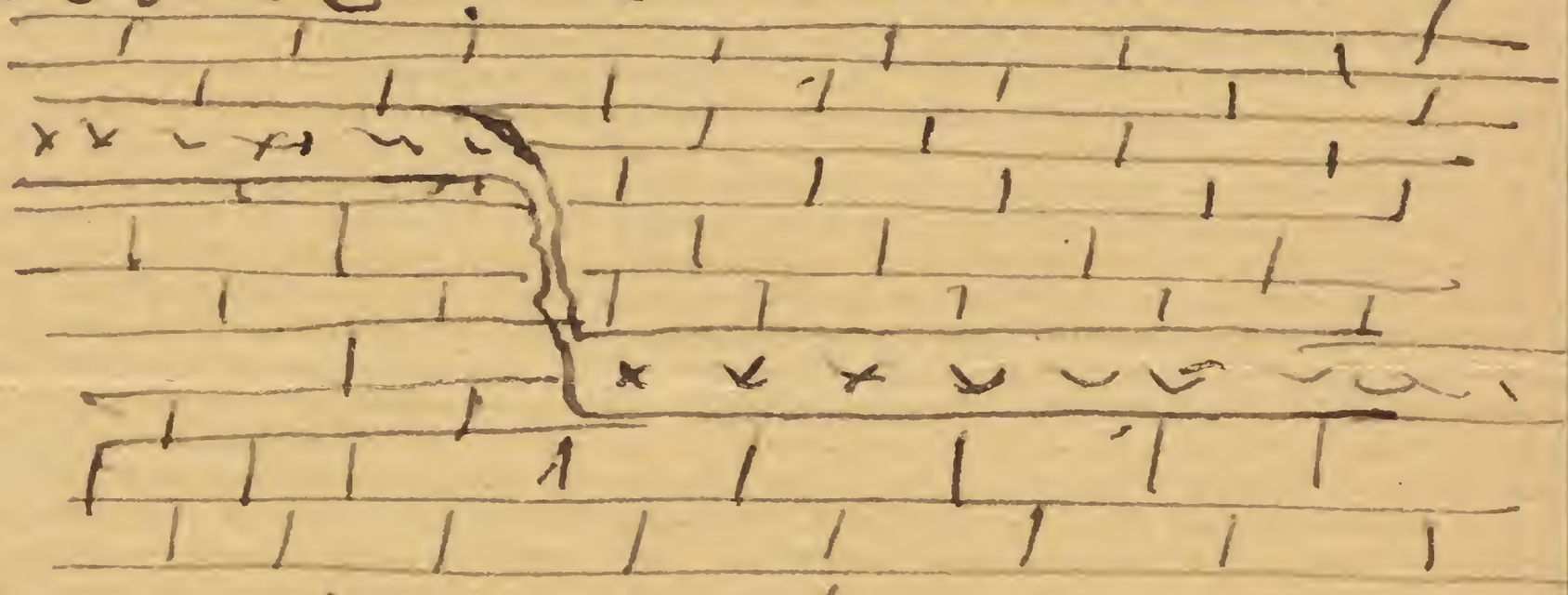
Flathead shales -

2. Thin bedded & sdy shales
with irregular thin
bedded shaly limestone
carrying Middle Cambrian
fossils. (a) 180 - 200 feet.

(5) Intrusive eruptives
occur from 100 feet up -
to one interstratified
sheets. Fragments of the
shales are ~~met~~ sharp
in the eruptive on
the north side of Beaver
Creek. The eruptive sheets
about 120 - 150 feet to the thickness

over.

The ~~emptiné~~ follows the parting of the layers or the lines of ~~64~~ 5 bedding for long 320. distances but it ~~may~~ was seen in places to leave some rough parting & draps a few feet or disappear altogether. Occasionally



it bunched up so as to form as a small lacalite In endurstances the strata merged more or less broken up.

Caulnii (3) Beaver Creek.

Total for 2 - 695.

Purple & green argl shales comes in at about 600 feet.

Limestone

(3.) Thin-bedded bluish-grey lm - with family of thin Pby.

Dip. Nth. 30° S. W.
Str. N. 50° W.

Acrotreta
Obolella -
a. Lm - 6 ft -
t. Lava - 10 in.
c. Lm.

Can 165 ft of the lm becomes more massive & grey in color. Both it & is made up of thin layers grouped in massive layers. Can 360 ft thick including layers at base & continue

17 4

5 1
5

2 5 5
3 5

42

~~825~~

127.
5

635
85

720

36
5

180
25

205

1 = 640
2 = 695
3 = 720.
4 = 290.
5 = 205

2550

Cambrian (4) Beaver Creek.

to the top of the formation.
Fragments of trilobites shown
here & there but not very
rarely. Total of 3 720 ft

4. Shale.
Green & purple argl
shale + 290. ft

A bed of lava irregularly
bedded rests on the lime-
here & the shales of 4.

5. massive bedded grey
~~to~~ calitic lm-
passing above to
flesh-grey thin
bedded fossiliferous
lm 205.
M. C. fossils

Cambrian (5) Beaver Creek

6. Light gray, arenaceous, finely granular or subcrystaline lm. (S 1/4 N. 40° W. > 23° S. W. In the lower 25 feet small Hyolithes — = ▭ ▷ occur with ~~fragm~~ bits of trilobites - Above the strata became more massive & coarser. a bed of intrusive lava 3 feet thick occurs near the base - 135.

2685

Silurian. 6 Beaver Creek

1a massive bedded, dark
~~steel~~ grey arenaceous
lm. weathering to a
dirty brownish-grey —
(oil stain brown) color.
Obscure fragments of
fossils occur in the
lore. ap 65 feet a
~~coquina~~ sand 18m thick in a
massive layer 3 feet
thick is almost made
up of Stramatopora —
Favosites — etc.
Obscure fragments of
gastropods & brachiopods
occur 162 feet ap &
again ap 350 feet above

Silurian. 7 Beaver Creek

in a layer of light gray
fine arenaceous lm. 4a
dark layer above -
Noted. Stromatopora
Streptelasma, Heliolites -
sections of branched
& gasteropod. 9 -

Total of 1a 575

1b Light gray arenaceous
lm. that forms a
strongly fronted even
tapped low cliff -
towards the summit
S. N. 60° W. > 23° S.W.

180.

Numerous small chert nodules
occur in association with
bits of Stromatopora, on the
thinner layers near the
top.

1a	135.
1b	575.
1c	180
	890.

350. - 140/5 = 700.

980 | 80

225/5 = 1125/130 = 1255

1575 | 131

~~Devonian?~~ S. Beaver Creek

D Cambrian

@. Bluish gray thin bedded limestone with chert nodules & layers of chert in some of the layers. (Layers 1 - 6" - 12" - 24" thick -

This band begins at a saddle west of the slope on the top of 1c. It is a marked feature on the north side of Beaver creek beneath the massive grey lm cliffs.

At 375 - 400 feet noted Stictoporella Strophomena ? Productus ? -

At 740 - feet abundant ~~Devonian~~ fauna

Total of 1a 780.

$$
\begin{array}{r}
375 \\
\times\ 5 \\
\hline
1875 \\
+\ 200 \\
\hline
2075
\end{array}
$$

2425

~~Cocoa ??~~ (9) Beaver Creek

1b Light gray arenaceous dolomite fine granular limestone in massive beds, in places carries chert nodules, weathers rough in jagged cliffs.

× at 1225 feet with corals

1850–1900 ft with

at the corals are in great abundance Masses of diphyphyllum 2 to 3 feet in diameter. Syringopora etc etc.

2075

1c Shales ds with interbedded bands of grey limestone. at about 600 feet the bryozoan remains

are abundant. The
section is taken by
the Missouri river but
on the west side of the
river high cliffs of
sandstone etc rise
fully 1000 feet back
from & above the river.

S. C.

40.
43.
46.
69.
120
155

Aug. 20th 1900

Lewis & Clarke Pass.

The saddle at the pass trends N.W. & S.E.

Algonkian

The Belt rocks form the S.E. side & the Cambrian Flathead rocks the N.W. The debris of the rock is scattered all across the saddle. The outcrop of Flathead rock swings west leaving the hills on the west side of the drainage line the uncovered reddish brown Belt rocks & shales, as in the section previously on the ridge N.W. of the Pass.

R. R. (7.) Pre-Cam

Lewis & Clarke pass. 10 mi. South of Hectar near S. Dearborn Riv

1. Grey sdy shales thin bedded sds - an 1210 feet with a layer of Pseudo-Stromatopora lm - 2 feet thick occurs + another at 1210 ft.

1210.

2. Thin bedded grey lm - interbedded with blue shaly lm - with 2 layers of intraformational conglomerate formed of thin shaly lm - Hard layers weather buff - At 220 feet the blue limestones disappears - arenaceous layers replacing it - the grey lm becomes more arenaceous & soon gives way to sdy beds - 285.

3. Grey, hard sdy shales & sds with reddish

~~179~~

180

900

120

1575

221

796

40

45

brown ady shales & thin
bedded sds alternating
in bands - 20 to 40 feet

Str. N. 40° W / 20° S. W.

apart at first - apr 200
feet the reddish - brown
beds begin to predominate.
Total of 3 ——— 225

4. Reddish brown ady
shales & sds - 790.

No 4. is the Spokane
formation of the Belt
terrane & comes beneath
the Cambrian / Flathead
sd).

In the first portion
of the section the
Greyson shales are
beneath the Cambrian
sds.

Beds tenanted

Clearbrook area.
Lewis & Clarke Pass.

4 Reddish-brown rdy sh & rds - 790.
(Spokane.)

3 Grey rdy sh & rds 225.
(Greysan)

2 Silicious grey lm 285.
(Fernland)

1 Grey rdy sh & rds 1210
(Chamberlin) 2510

8-27-1900

Montour Creek Section.

Montour Cr. and its several branches have worked deep canons in the massive hard siliceous shales and sandstones that form the ranges on the north side of the Big Blackfoot Valley, from a little W. of the Lewis & Clarke pass to Montour Cr., and beyond.

Montour Cr. and its principal E and W branches are base-leveled for about 3 mi. above where the two branches unite. Below the union of the two branches to canon is a mile or more broad, and the stream is engaged principally in moving the detritus washed into it from above. It has the broad U-shape characteristic of glaciated valleys. On the E side of the mouth of the canon there is a thick belt of conglomerate, formed of the rocks derived from the drainage basin of Montour Cr.

This conglomerate appears to be of Tertiary or pre-Tertiary age, as it rises high above the glaciated plain that extends for 6-10 mi. southward from the mouth of the canon.

Rock section. At the top of the Lewis & Clarke pass, beneath the Flathead sandstone, there is a series of reddish-brown and greenish sandstones, dipping westward. There apparently pass beneath reddish & purple sandstones that form the mass of Stonewall Mt., the crest of which is a syncline. The structure was not traced westward of this; but apparently the reddish-brown and green sandy shales, sandstones, and massive gray and quartzitic sandstones, that are several thousand feet in thickness in the Montour drainage basin, represent the series that comes above the Lewis & Clarke pass section and above the rocks of the Belt terrane as developed in the Big Belt Mts.

18-24-1900

Conglomerate at mouth of Canon of Montour Creek. Marsion

conglomerate, several hundred feet thick, forming high hills on the E. side of the canon about 6 mi. N-NW of Ovando, Mont. Matrix of conglomerate a fine yellow sand. Congl. formed of limestone, - bluish gray, buff, and buff mottled with irregular wavy threads and bunches. Bluish gray limestones; also gray, purple, mottled purple and buff, reddish brown, yellow sandstones; also hard purple and buff arenaceous shales. Boulders of limestone 2 ft. across, with very irregular angles occur. Most of the material have evidence of having been deposited within a comparatively short distance of its source.

So far as observed the material appears to have come from formations of the Belt Terrane.

July 20/1900.

Rocky Mts. Section 4 Upper Steam P.O. Lewis & Clarke Co. Mont.

Section begins with a thin bed of lm- resting on an intrusive (?) & little W. of Steinbach & Alr ranch house.

From base up.

1. (a) Bluish-gray lm- in thin layers. 15 ft

(b) ~~Silico + arenaceous shale + thin bedded greenish~~ Shaly + thin bedded siliceous + arenaceous shales. Greenish colored with occasional bands of purple & ft 715.
when purple predominate (00 en) 960.

Outcrop (Speech of 225 ft) Vertical strata

170 5

850.
110.

960.

The dip begins at 30°
& then passes over a low
chasto wave before reaching
the 1st lava bed
Cantern at 20° for some
distance & then gradually
increases to 45°

429. 563. Lava

134. 44
5

670.

760

925
2430

3706.

429. 143
5

2145. 286
286

2431

47. 16
5

235
30

265

R. Va. Section. (2)

c) Massive layer of fine y/g calcareous

~~sand~~.

d) Purple arenaceous shale with occasional thin beds of greenish shale. Str. N. 65° to 60° W. / 45° N. as the greenish calcareous shales predominate with bands of purple. This member is 200 feet of arenaceous shale with thin traces of life as far as known.

2430.

e) The shaly beds of (d) become more siliceous & banded & pass into banded siliceous beds an 760 feet an intrusive sheet of dark ~~basaltic~~ intrusive basal

385
5
435

115.
5
575.
75
650.

38
77

203
5
1015
+3
26

,67
135

80.
400
45
76
121 5

comes in - 35. feet.
Seventeen feet above the
lava a layer of dark
siliceous slaty shale 3
feet occurs - that is much
like the Chamberlin
shale of the Belt terrane.
Some of the beds of shaly
beds are slightly green - other
greenish. There will be
a few feet of arenaceous
beds & then compact siliceous
banded layers that are
~~almost~~ flint-like in
appearance,
Dark mud cracks occur at
various horizons indicating
deposition between tides.
Total of E - 1215.

f. Purple siliceous beds
passing to thin bedded
fine grained reds & to
shales similar to those

1) a - 15.
f - 960.
e - 2
d - 2430
Σ - 215

July 20.

4622.

2) a - 435 - km.
3 a - 75
a' f - 205
c - 4
d 225

6716.

4

of (d). Thin bands of greenish-colored arenaceous shale are interbedded at irregular intervals. Str. N. 40° W / 25° S. W. near base. Ah about 1000. feet ah S. N. 40° W. > 30°

Greenish shales (arenaceous) + thin beds of sd sandstone in all ~65% + ah. 1150

2 a

a) Gray, slightly siliceous, weathering buff. shaly to layers a fort thick. ah 230 feet ah blue layers are interbedded 4 at 255, massive layers of intraformational conglomerate, broken up shales, blue buff. Oolitic layers also occur ah several horizons. 435

R. M.

5

Total of Z = 435.

Z^a. Buff sdy shale B. 75

f. Thin-bedded grey sd weathering buff-grey, with greenish tints - 205

e. Pseudo-stromatopora lm -

d. Thin bedded green-ish gray sandy strata up to 160 feet when the color changes to gray weather gray-buff. 225.

c. Massive bedded coarse sd. with small g's pebbles.

Flatheads -

beds of the

Cambrian (Lt. blue)

3 = Shortcane red

Belt Terrane

Jam

Cambrian

Helena lm. Newland L.

Greyson

Flathead

Empire shale

Phosphoria

a b c d

E

R. M.

(6.) Cambrian

1a) massive, cross bedded coarse sd with small white qtz pebbles. 255.

1b Thin bedded sand stones & sdy shales with numerous annelid trails & fragments of trilobites - Olenellus -

Hyolithes -

The sandstone 1a =
Flattened sandstone
1b = " shales -

a few thin beds of lm-
& then a faulted
off the section.

210
5
1050.

250.

40

6a

Belt Terrane.

Clearbrook quartz area.

Cambria

Grey rock. 510.

Silicious lm (Helena lm) 435.

Purple andesite rock 1150.

Grey & greenish rock 1215.

Purple & green ar. shale 2430.

Greenish andesite shale 960.

5755

Lm - (Oak of Newland) 15

6770

Grayson Rhyolite & Eruptive

Eruptive -

Limestones

Sept. 21/15

Shale

Sandy Shale / Black Butte Canyon

a. b. c. d. e. f.

a. Upper arenaceous shale

b. Canyonia -

c - Newlandia major -

d - Freyonia

Lectian going down -

a Shale (arenaceous) grey

b. Thin bedded sandy flinty - grey limestone with H. 21.
traces of fossils

c. Bluish grey limestone in layers a bed of algal deposit - Camasia

occurs at this taxy as a layer 12 & 14 in thick. Beneath this a layer 6 in thick

with the algal [illegible] deposit-forming concentric rings  on upper surface. Some of these are 10 to 14 feet in diameter with the concentric bands 1/4 to 2 cm. across. Beneath the upper surface of concentric bands the algal deposits form ~~very irregular~~ concentric ~~rings of irregular~~ laminations of ~~laminated~~ at irregular intervals by cross partitions. 1-6 in

d. Thick bedded flinty grey compact hard limestone 6 — 10 ft

e. Bluish-grey limestone layer 6 to 8 in thick with Neuland's ~~Neuland's~~ abundant major — 0-6

f. Same as (d) with a trace of coarse algal debris in 3-6
other thick layer.

g. Algal bed with filling of bluish-grey limestone. 20 inches.

2/ Layer of bluish-grey lime with algal remains less abundant than in 1. 9 in 2-5

35-

h- Grey arenaceous shale —

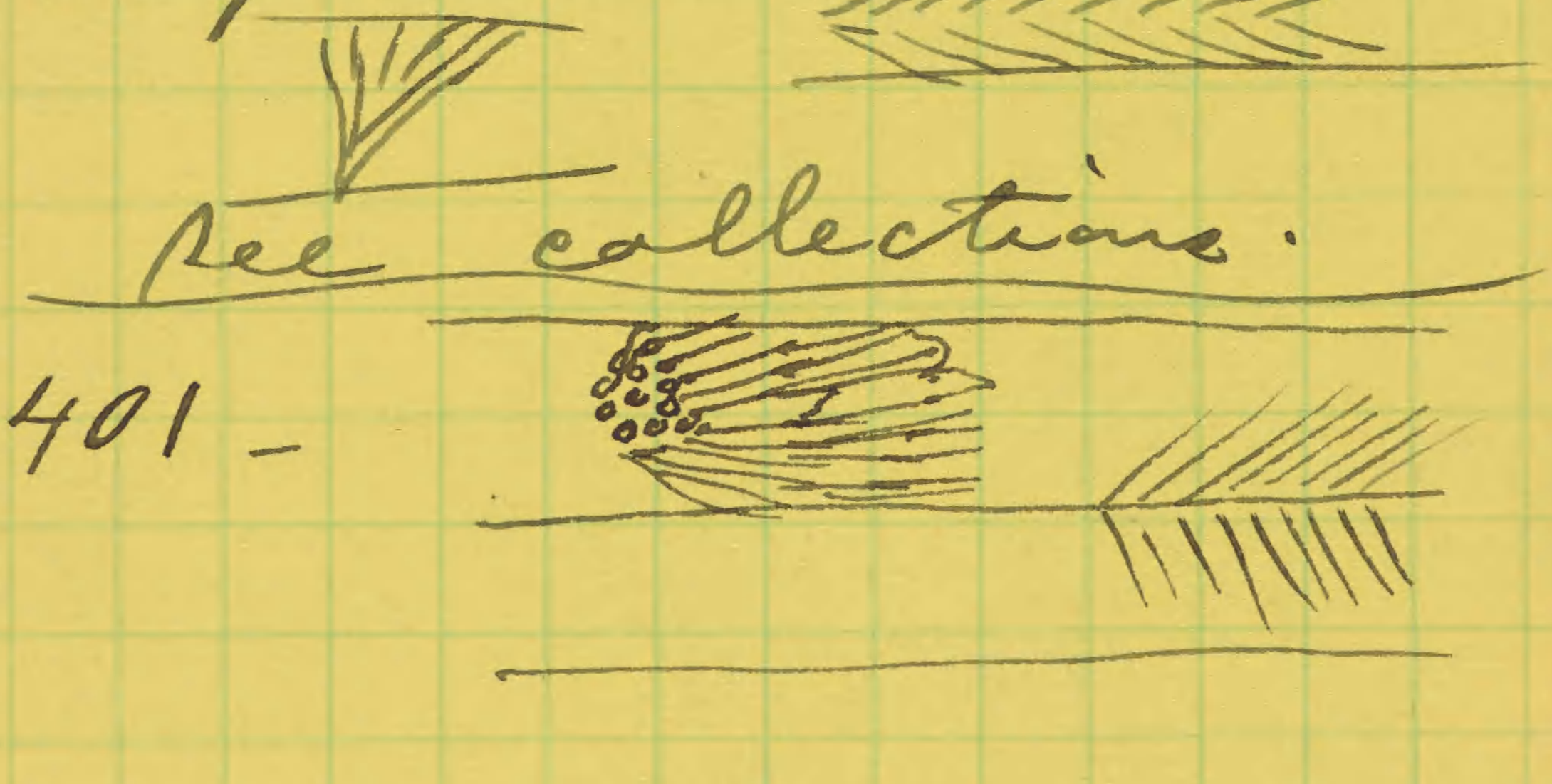
The above algal bed is finely exposed on each side of canyon (Black Butte) entering Deep Creek canyon from the south just above the Forest Ranger Station & 3/4 miles above

4

Glenwood on Sleepy Creek +

The lower bed of algal remains is rather thin for about 1/4± of a mile

It is made up of one species that has an almost plant-like growth in places.



See collection.

401 –

Sept. 24/15

Newlandsia marjani.

Occurs in layer 6" to 8" thick that can be traced for a long way (1200 feet) on the each side of Black Butte canyon - on entering Deep Creek Canyon from the south just above the Forest Ranger Station.

The partitions extend from the bottom to the top of layer [illegible] and show concentric rings at upper surface.